

Work-Based Learning (WBL) Future Research Agenda and Its Potential for Maritime Education and Training 5.0 (MET 5.0)

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ABSTRACT

The purpose of this research is to develop a comprehensive future research agenda for WBL within MET. This research employed a bibliometric analysis methodology, utilising performance analysis and science mapping to systematically review and synthesise existing literature on WBL within MET. The analysis draws on data from the Scopus database, covering publications from 1988 to 2024. The research identified six core research themes in WBL, including Foundations of WBL, Digital and lifelong learning, Reflective and action-oriented practices, Academic-workplace synergies, Curriculum and experiential development and Interdisciplinary collaboration. These themes reflect the multifaceted nature of WBL and its critical role in preparing the maritime workforce for MET. This research provided a novel contribution by systematically mapping the existing body of knowledge on WBL within the context of MET. It offers a forward-looking research agenda that aligns with the evolving needs of the maritime industry.

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1. Introduction.

WBL has emerged as a pivotal component within contemporary educational frameworks, prioritising experiential learning in real-world contexts (Fergusson, 2019; Ismail et al., 2021; Keeling et al., 2014; Nurdyanto, 2018). Its integration across diverse educational settings has demonstrated efficacy in augmenting skill acquisition, bridging the gap between theoretical knowledge and practical application, and fostering professional growth (Ismail et al., 2021; Rienties et al., 2023; Siregar, 2018; Thake, 2021). WBL provides students with invaluable skills, including clinical, personal, cultural, and professional skills (Al Sattar et al., 2023). It enhances students' employability skills and career development learning, leading to improved industry networks (Dean & Rook, 2023; Konstantinou & Miller, 2021). Thus, WBL offers economic benefits performance and students' employability skills and career development, contributing to

improved academic performance, and preparing individuals for long-term career success.

Within MET, the incorporation of WBL may hold substantial promise for cultivating essential competencies (Perusso & Wagenaar, 2022), tackling industry-specific challenges (Autsadee & Phanphichit, 2024), and aligning educational outcomes (Ngatia, 2022) with the demands of the workforce in the maritime sector. The maritime sector, renowned for its dynamic nature and stringent operational standards, necessitates an educational framework that not only imparts theoretical knowledge but also ensures practical proficiency (Kalnina & Priednieks, 2017; Kumar & Rajini, 2024). WBL also offer benefit such as practical experience, improved employability, networking opportunities, and real-world problem-solving skills, industry knowledge, professional development, and better learning outcomes (Autsadee & Phanphichit, 2024). WBL approaches, particularly experiential and reflective learning models, are well-suited to address the imperative of aligning educational outcomes with industry requirements by providing immersive, -hands - on learning experiences directly connected to maritime operational environments. Nevertheless, despite its potential, a comprehensive exploration of future trajectories of WBL within

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MET remains relatively underexplored. This research endeavours to bridge this scholarly gap by employing bibliometric analysis to systematically review and synthesise existing literature on WBL, and its application within MET.

The purpose of this research is to utilise performance analysis and science mapping as an innovative tool to conduct a comprehensive analysis of WBL and its potential in the MET. The objectives of this paper are to identify volume of the WBL knowledge based evolved over time, identify the most significant journals and articles in the field of WBL and highlight future research agenda of WBL for MET. Based on the stated objectives, this paper aims to address the following research questions: *RQ1: How has the volume of WBL knowledge evolved over time?*, *RQ2: Which journals and articles are considered the most significant in the field of WBL?* and *RQ3: What are future research agenda of WBL for MET?*

The remaining sections of this research are organised as follows: section 2 presents research methodology where approach to bibliometric analysis, encompassing data acquisition from Scopus and delineating the analytical tools employed. Section 3 presents the results and analysis to each research question. Section 4 shows discussion. Conclusion will be presented in section 6.

2. Research Methodology.

This research utilised a bibliometric analysis methodology to comprehensively evaluate and amalgamate the extant literature pertaining to the influence of WBL in MET. Bibliometrics is a research methodology that employs quantitative analysis to examine publications, citations, co-citations and co-word analysis to delineate the intellectual framework of a specific field of this research (Autsadee et al., 2024). Within the scope of this research, the utilisation of performance analysis and science mapping enables the identification of prominent research performance, past, present, and future themes within the existing body of literature (Donthu et al., 2021). This analytical approach provides valuable insights into the subject matter being examined (Jan et al., 2023; Maghsoudi et al., 2023).

This study is a literature review that followed an SLR methodology as shown in Figure 1. A protocol was developed to determine the inclusion criteria of articles and analysis methods. Articles included following a standard guideline recommended for a PRISMA (Choudhary & Jain, 2024). The PRISMA has four steps: identification, screening and inclusion (Rehman et al., 2020). The Scopus database, renowned for its extensive coverage of scholarly publications across multiple fields, serves as the principal data source for this bibliometric analysis (Bakhmat et al., 2022). The procedure of data collecting entails using a thorough search strategy that incorporates pertinent keywords to get applicable papers from the Scopus database. The utilised keywords encompass a range of variations and synonyms pertaining to concepts such as “Work-based learning.”

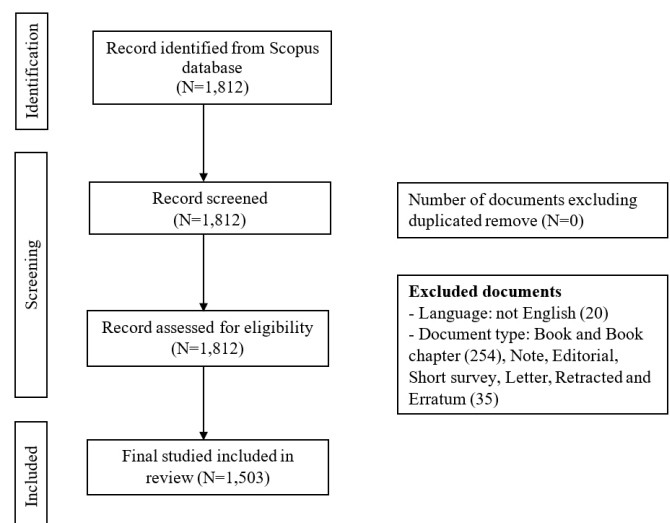
Documents were screened in the second stage to check duplicated files. The documents were also filtered incomplete information such as missing authors. As a result, no documents were excluded during this stage of the screening process. Next,

291 documents were excluded using the default automatic eligibility functionality of the databases by following the inclusion criteria (language: English (20); document type: book and book chapter (254) note, editorial, short survey, letter, retracted and erratum (35)). The search’s temporal reach extends to publications from 1988 to 31 Dec 2024, so ensuring the incorporation of contemporary research contributions. Then, the Scopus files were exported as .CSV file. Citation information, bibliographical information, abstracts, keywords, funding details, and other information were extracted for bibliometric analysis. After this step, 1,503 documents met the inclusion criteria for this research.

The VOSviewer software was employed to represent results based on the objectives as an enrichment technique (Le & Nguyen, 2023). The techniques, particularly citation and network analysis, can enhance performance analysis and science mapping (Saini et al., 2022). Network analysis is useful for illustrating bibliometric analysis (Kent Baker et al., 2020; Tunger & Eulerich, 2018). Donthu et al. (2021) represent that using network analysis can present add-on performance analysis and science mapping to enrich the outcome of bibliometric analysis. Therefore, the use of network analysis, coupled with science mapping software can enhance performance analysis and science mapping in bibliometric analysis.

Finally, the quality of a review suffers due to researcher bias in article selection and analysis (Priyashantha, 2023). The selection bias can be minimised by following a review protocol, a systematic, objective article selection procedure (Priyashantha, 2023; Xiao & Watson, 2019) and conducting a parallel independent quality assessment of publications by two or more reviewers (Brereton et al., 2007). Moreover, a preliminary protocol design that predetermines the analysis procedures can help to reduce analysis bias (Xiao & Watson, 2019). Thus, those procedures were followed to eliminate bias in article selection and analysis.

Figure 1: Flow diagram for search and screening process.



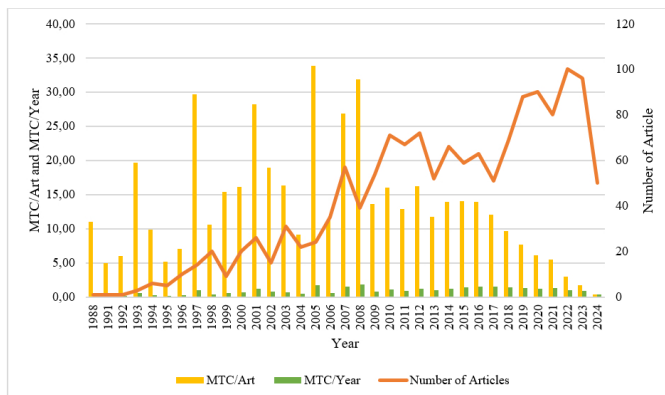
Source: Authors.

3. Results and Analysis.

3.1. Reconfiguring the WBL Knowledge Base: Volume and Regional Distribution.

Figure 2 illustrate trends in the number of articles published annually, as well as metrics such as the average number of citations per article (MTC/Art) and the total number of citations per year (MTC/Year) from 1988 to 2024. Initially, both the number of articles and the MTC/Art were relatively low, with notable spikes in 1993, 1997, and 2001, reflecting periods of increased citation impact per article. Post-2000, there is a general upward trend in the number of articles published, peaking in 2022 with 100 articles. However, the MTC/Art exhibits fluctuations, with significant peaks in 2005, 2007, and 2008, indicating high citation impact. The recent years (2022–2024) show a decline in MTC/Art, while the number of articles remains high, suggesting a potential shift towards higher output but may take time to have an impact. This data provides insights into the evolving landscape of publication volume and citation impact over the decades.

Figure 2: Annual publication and citation trends in work-based learning.

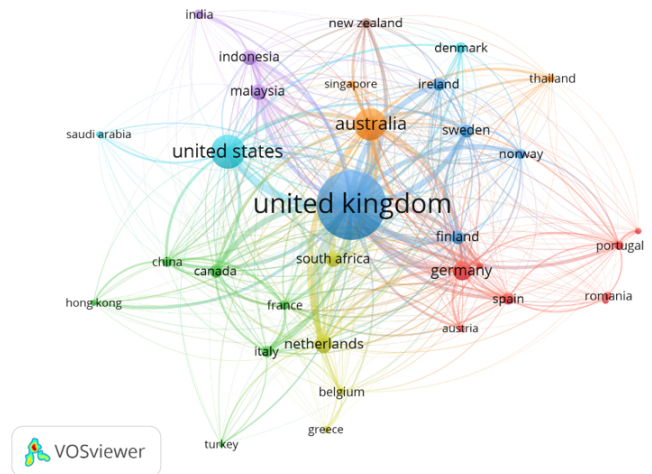


Abbreviation: MTC/Art = Mean Total Citation per Articles and MTC/Year = Mean Total Citation per Year.

Source: Authors.

Table 1 and Figure 3 network visualisation provides an in-depth look at the research collaboration and citation metrics of various countries. The United Kingdom stands out with the highest total link strength of 17,607, indicating strong international research collaboration, and it has published the most documents (707) and received the highest number of citations (9,360). This suggests a significant global influence in the field. Finland, despite having only 27 documents, shows a remarkable average citation per document of 44.96, highlighting the high impact and quality of its research. United Kingdom, Australia and United States also show strong research outputs and substantial total link strengths, underscoring their active participation in international collaborations.

Figure 3: Country collaboration network in WBL research.



Source: VOSviewer software.

Table 1: Top 10 countries with the highest scientific production in WBL: ranking by number of citations.

Country	Documents	Citations	Avg. citations	Total link strength
United Kingdom	707	9360	13.24	17607
Australia	151	2570	17.02	8586
United States	169	2163	12.80	3583
Finland	27	1214	44.96	2152
Netherlands	49	1083	22.10	3167
Canada	24	620	25.83	1844
Germany	54	612	11.33	2740
South Africa	34	278	8.18	1376
France	14	241	17.21	1031
Sweden	26	206	7.92	1814

Source: Authors.

3.2. Prominent Journals and Documents in the Field of WBL.

Table 2 presents an analysis of the most influential journals in the field of WBL based on two different ranking criteria: documents (Doc) published, and the total citations (TC) received. The HESWBL journal emerges as the most prolific, with 135 documents and a total of 1,162 citations, reflecting a strong influence in both rankings. Notably, HESWBL, JWAM and JIC also rank high in both metrics, indicating their significant impact and contribution to the field. Interestingly, ML although publishing fewer articles (7), exhibit exceptionally high average citations per document, suggesting that the limited publications are highly impactful and frequently referenced in subsequent research. Conversely, journals like DLO and RPCE, despite having a fair number of documents (29 and 24), have relatively low average citations (2.66 and 5.83), indicating a few influences per article.

Table 3 highlights the top ten highly impactful articles in the field of WBL, based on citation. Päivi Tynjälä's 2008 article stands out as the most cited with 749 citations, underscoring its substantial impact on understanding workplace learning dynamics. Similarly, Pittaway and Cope's 2007 has garnered 407 citations, reflecting its critical contribution to integrating experiential and collaborative learning approaches. Other influential

Table 2: Top 10 journals with the most influence in WBL.

Journals	Doc	TC	Avgc.	Journals	Doc	TC	Avgc.
<i>Ranking by NA</i>				<i>Ranking by TC</i>			
HESWBL	135	1162	8.61	HESWBL	135	1162	8.61
JWAM	37	750	20.27	ML	7	795	113.57
JIC	34	656	19.29	JWAM	37	750	20.27
JVET	32	429	13.41	JIC	34	656	19.29
JWL	29	447	15.41	ME	10	619	61.9
DLO	29	77	2.66	SHE	18	538	29.89
ET	24	431	17.96	NET	19	463	24.37
RPCE	24	140	5.83	JWL	29	447	15.41
NET	19	463	24.37	ET	24	431	17.96
SHE	18	538	29.89	JVET	32	429	13.41

Abbreviation: Total Citation (TC), Documents (Doc), Average citations (Avgc.), Development and Learning in Organizations (DLO), Education and Training (ET), Higher Education, Skills and Work-based Learning (HESWBL), Journal of Interprofessional Care (JIC), Journal of Vocational Education and Training (JVET), Journal of Work-Applied Management (JWAM), Journal of Workplace Learning (JWL), Management Learning (ML), Medical Education (ME), Nurse Education Today (NET), Research in Post-Compulsory Education (RPCE), Studies in Higher Education (SHE). Source: Authors.

works include Joseph Raelin's 1997 and 2001 articles, which have received 281 and 261 citations respectively. Raelin's contributions, particularly his model of WBL and exploration of public reflection as a learning basis, are pivotal in shaping theoretical and practical understandings of WBL. Ruth Helyer's 2015 article on the critical role of reflection in WBL (217 citations) and Tim Swanwick's 2005 exploration of informal learning in medical education (194 citations) also emphasise the diverse contexts in which WBL principles can be applied. These highly cited articles collectively underscore the importance of integrating reflective practice, experiential learning, and interdisciplinary approaches in enhancing the effectiveness of WBL.

Table 3: Top ten highly impactful articles in WBL.

Author(s)	Title	Citation
(Tynjälä, 2008)	Perspectives into learning at the workplace (https://doi.org/10.1016/j.edures.2007.12.001)	749
(Pittaway & Cope, 2007)	Simulating entrepreneurial learning: integrating experiential and collaborative approaches to learning (https://doi.org/10.1177/1350507607075776)	407
(Raelin, 1997)	A model of work-based learning (https://doi.org/10.1287/orsc.8.6.563)	281
(Raelin, 2001)	Public reflection as the basis of learning (https://doi.org/10.1177/1350507601321002)	261
(Rae, 2005)	Entrepreneurial learning: a narrative-based conceptual model (https://doi.org/10.1108/14626000510612259)	244
(Helyer, 2015)	Learning through reflection: the critical role of reflection in work-based learning (WBL) (https://doi.org/10.1108/jwam-10-2015-003)	217
(Lester & Costley, 2010)	Work-based learning at higher education level: value, practice and critique (https://doi.org/10.1080/03075070903216635)	210
(Swanwick, 2005)	Informal learning in postgraduate medical education: from cognitivism to 'culturism' (https://doi.org/10.1111/j.1365-2929.2005.02224.x)	194
(Scott, 2007)	Capitalism and urbanization in a new key? the cognitive-cultural dimension (https://doi.org/10.1353/sof.2007.0078)	170
(Blenkley & Bligh, 2008)	Students learning from patients: let's get real in medical education (https://doi.org/10.1007/s10459-006-9028-0)	167

Source: Authors.

3.3. Future Research Themes in WBL

Co-word analysis, which displays the correlation strength of each node, is used as a visualisation algorithm for node similarity, where the distance between nodes represents the strength of correlation (Donthu et al., 2021). Using VOSviewer's clustering and mapping methods, the study identifies three core

themes in WBL research. Table 4 illustrates the results of a co-word analysis focused on WBL. The table categorises the identified themes and their associated keywords, which were derived from the co-word analysis. Each theme captures a distinct aspect of WBL, namely "Foundations of WBL," "Digital and lifelong learning," "Reflective and action-oriented practices," "Academic-workplace synergies," "Curriculum and experiential development" and "Interdisciplinary collaboration." These themes reflect the multifaceted nature of WBL, highlighting how it intersects with various educational strategies and practices to enhance learning outcomes, employability, and professional growth.

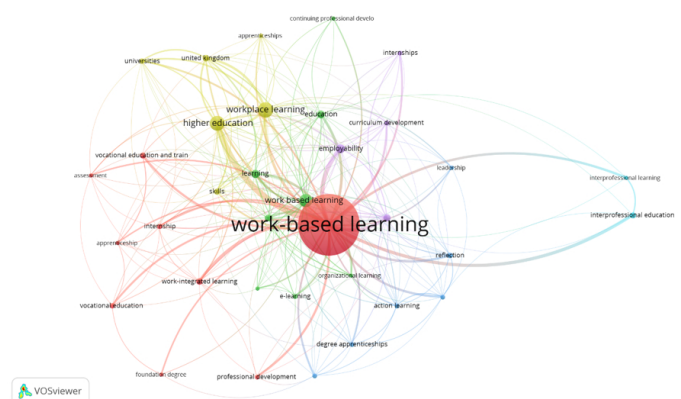
Table 4: Identified themes and keywords in WBL through co-word analysis.

Themes	Keywords
Foundations of WBL	Apprenticeship (15), Assessment (16), Foundation Degree (15), Internship (22), Professional Development (20), Vocational Education (21), Vocational Education and Training (25), Work-Based Learning (644), Work-Integrated Learning (30)
Digital and lifelong learning	Continuing Professional Development (15), E-Learning (20), Education (37), Learning (40), Online Learning (16), Organizational Learning (16), Training (29), Work Based Learning (76)
Reflective and action-oriented practices	Action Learning (19), Action Research (19), Degree Apprenticeships (19), Leadership (15), Reflection (21), Reflective Practice (18)
Academic-workplace synergies	Apprenticeships (15), Higher Education (86), Skills (25), United Kingdom (29), Universities (21), Workplace Learning (91)
Curriculum and experiential development	Curriculum Development (18), Employability (44), Experiential Learning (34), Internships (18)
Interdisciplinary collaboration	Interprofessional Education (24), Interprofessional Learning (16)

Source: Authors.

Figure 4 visually represents these themes and their interconnections within the field of WBL, using a network map. The size of the nodes indicates the frequency of each keyword, with "Work-based learning" being the central and most prominent term.

Figure 4: Co-words analysis in WBL research with minimum number of occurrence keywords 15.



Source: VOSviewer software.

The lines connecting the nodes show the relationships between the keywords, illustrating how closely linked concepts like workplace learning, higher education, and employability

are to WBL. This visual representation helps to underscore the complexity of WBL and its integration across various educational and professional domains, reinforcing the idea that effective WBL requires a holistic approach that encompasses multiple dimensions of learning and professional development.

4. Discussion.

The results from the bibliometric analysis of WBL reveal significant trends in the evolution of WBL literature, as well as the regional and collaborative dynamics of research output. The increase in publication volume post-2000, peaking in 2022, underscores the growing recognition of WBL's importance in bridging theoretical knowledge and practical skills in the maritime sector. However, the recent decline in MTC/Art suggests a potential shift towards higher output with delayed impact, highlighting the need for ongoing research that balances quality with quantity. The strong presence of the United Kingdom, the United States, and Australia in international collaborations demonstrates their leadership in driving WBL discourse, while Finland's high average citation per document points to the significant impact of quality research in smaller academic communities. This geographical imbalance raises critical questions regarding the transferability of WBL models to other regions, particularly within the maritime education sector where cultural, regulatory, and economic conditions differ significantly.

The analysis of prominent journals in WBL reveals that specific publications have emerged as key platforms for advancing the field. The dominance of the HESWBL journal, with 135 documents and over 1000 citations, highlights its pivotal role in shaping WBL research. The top ten impactful articles in WBL illustrate the field's rich theoretical and practical development, with significant contributions spanning diverse contexts. Tynjälä (2008) seminal work, leading with 749 citations, provides foundational insights into workplace learning perspectives, highlighting its role in bridging academic and practical domains. Similarly, Raelin (1997) and (2001) models of WBL and public reflection emphasize the interplay between experiential learning and critical reflection, underscoring reflective practice as a cornerstone of effective WBL. Contributions like Pittaway and Cope (2007) focus on entrepreneurial learning and Helyer (2015) emphasis on reflection further extend WBL's scope to include innovative learning approaches and reflective frameworks. The inclusion of articles addressing informal learning (Swanwick, 2005) and narrative-based models (Rae, 2005) highlights WBL's adaptability across sectors such as higher education, medical education, and entrepreneurship. Collectively, these works underscore WBL's interdisciplinary nature and its pivotal role in integrating learning with professional development, offering a robust foundation for future research and practice.

WBL encompasses a broad spectrum of themes, reflecting its multifaceted role in bridging academic theory and practical application. At its foundation, WBL emphasizes apprenticeship, vocational education, and professional development as pivotal for integrating theoretical knowledge into real-world

contexts (Evans & Cloutier, 2023; Shendell et al., 2021). Concurrently, the advent of digital and lifelong learning highlights the role of e-learning and continuing professional development, enabling adaptability in a rapidly changing workforce (Fahlman, 2017; Iredale et al., 2013; McCormack & Slater, 2006; Swallow et al., 2006). Reflective and action-oriented practices, such as action research and reflective practice, empower learners to engage critically with their experiences (Jones, 2013; Smith & Martin, 2014; Zuber-Skerritt & Abraham, 2017). Academic-workplace synergies underscore the necessity of aligning higher education with workplace demands, ensuring skills development that meets organizational needs (Gerhardt & Annon, 2023; Rowe, 2019; Rowe et al., 2017). Curriculum and experiential development enrich WBL by focusing on employability and experiential learning, equipping learners with practical competencies (Bramford & Eason, 2020; Feldmann, 2016; Gibson & Tavlaridis, 2018). Lastly, interdisciplinary collaboration through interprofessional education and learning promotes a holistic approach, encouraging collaborative across diverse professional domains (Firm et al., 2020; Hägg-Martinell et al., 2019; Straub et al., 2023). Together, these themes can create a robust framework for enhancing learner engagement and workplace efficacy.

5. Future Research Agenda for MET 5.0.

Introduction to MET within education and training is conceptualised as an educational framework that aligns with the goals of Maritime Society 5.0 (MS 5.0). MS 5.0 represents a paradigm shift in the maritime industry, emphasising the integration of advanced technologies, sustainability practices, and socio-economic development to create a future that benefits all stakeholders (Autsadee et al., 2023). In this context, MET 5.0 aims to prepare the maritime workforce with the skills, knowledge, and competencies necessary to thrive in this dynamic and evolving industry.

Table 5: MET 5.0 research agenda.

Research themes agenda for MET 5.0	Research Focus
Foundations of WBL	- Examine the effectiveness of apprenticeship models in MET for enhancing practical skills and career readiness. - Assess the role of professional development initiatives in fostering lifelong learning among maritime professionals.
Digital and lifelong learning	- Study the adoption of e-learning platforms in MET to improve access to maritime training for remote learners. - Provide a framework in adoption of e-learning platforms in MET to meet international standard. - Analyse the impact of online learning on continuing professional development in maritime sectors. - Investigate the effectiveness of WBL models in enhancing digital literacy and lifelong learning in MET.
Reflective and action-oriented practices	- Explore the application of action learning to improve problem-solving skills among maritime cadets. - Investigate how degree apprenticeships in maritime disciplines contribute to bridging the gap between academic knowledge and industry demands.
Academic-workplace synergies	- Examine strategies for aligning MET curricula with workplace needs to address skill shortages in the maritime sector. - Study the role of higher education partnerships in advancing workplace learning initiatives for maritime professionals. - Evaluate the impact of workplace learning programs on enhancing MET graduates' employability.
Curriculum and experiential development	- Investigate how experiential learning approaches, such as internships, enhance practical skills in MET. - Assess the role of curriculum development in fostering innovative thinking and adaptability among maritime students.
Interdisciplinary collaboration	- Explore the benefits of interdisciplinary learning in addressing complex maritime challenges. - Investigate how interprofessional education fosters teamwork and communication skills essential for maritime operations.

Source: Authors.

Table 5 represent MET 5.0 research agenda where is designed to align with the broader goals of MS 5.0 by integrating leadership development, digital learning, lifelong learning pathways, and enhanced workplace learning. This framework en-

sures that MET 5.0 not only prepares the workforce for the technological and sustainability challenges of the future but also contributes to the creation of a resilient and innovative maritime industry.

Conclusions.

The exploration of WBL within the framework of MET 5.0 reveals a significant opportunity to enhance the educational outcomes and professional development of maritime professionals. By aligning WBL practices with the advanced technological and sustainability objectives of MS 5.0, MET 5.0 can address the evolving needs of the maritime industry. The bibliometric analysis conducted in this research highlights the critical areas where WBL can contribute to the industry. These areas are essential for preparing the workforce to navigate the complexities of the modern maritime environment, which is increasingly shaped by digital transformation and global sustainability goals. Looking forward, the integration of WBL in MET 5.0 should continue to evolve, emphasising interdisciplinary collaboration and the adoption of digital learning tools. MET 5.0 can ensure that it remains at the forefront of educational innovation, equipping maritime professionals with the skills and knowledge necessary for success in a rapidly changing global landscape.

Disclosure Statement.

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this research.

Data Availability.

The data that has been used can be obtained from Scopus databased.

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